Creating Physically Consistent, Integrated Environmental Databases from Distributed Data and Modeling Resources

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ESG Scenario Production

- MEL Data Resources used as basis for construction
  - Component data sets for integration
  - Initialization data sets for environmental models

- Allow modeling resources to reside at and be maintained by operational providers
  - ESG is NOT a modeling capability
  - ESG is NOT designing an architecture around certain models

- Process must be easily configurable, robust, and repeatable
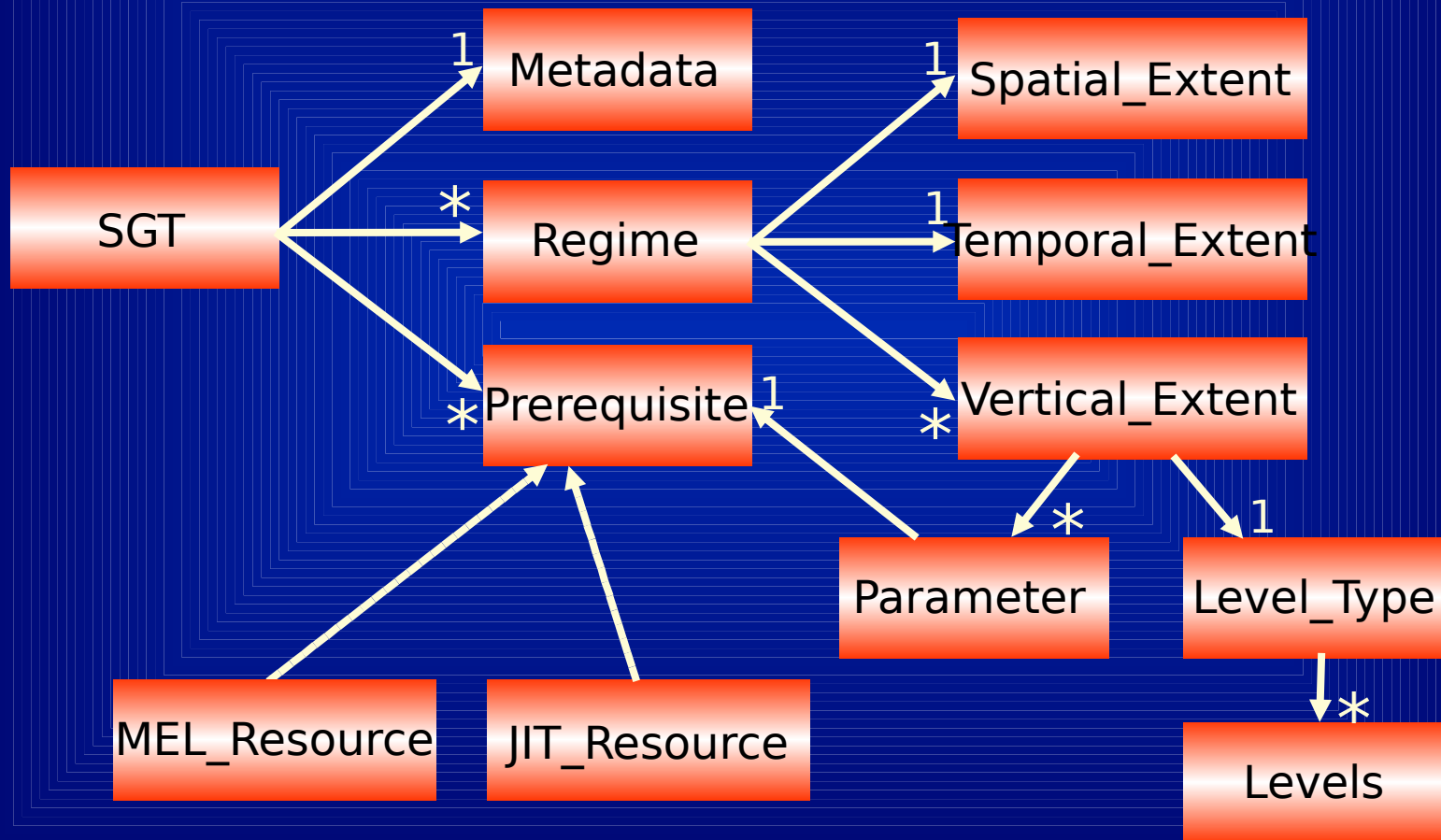 - User must be able to review and understand process

The Solution

- An XML based Scenario Generation Template (SGT) that captures:
  - Allows language and architecture neutral database specification
  - The Data and Model Resources to be employed
  - The Five Dimensional structure of the final database
- A Java based Five Dimensional Data Object
  - Handles collections of 2D Spatial Grids
  - Format neutral with independent encode/decode methods
  - Value-Adding Utilities
- Logical Java Business Objects
  - ScenarioOrder: Runtime Implementation of SGT
  - MELOrder: Ordering, delivery, and loading of MEL data
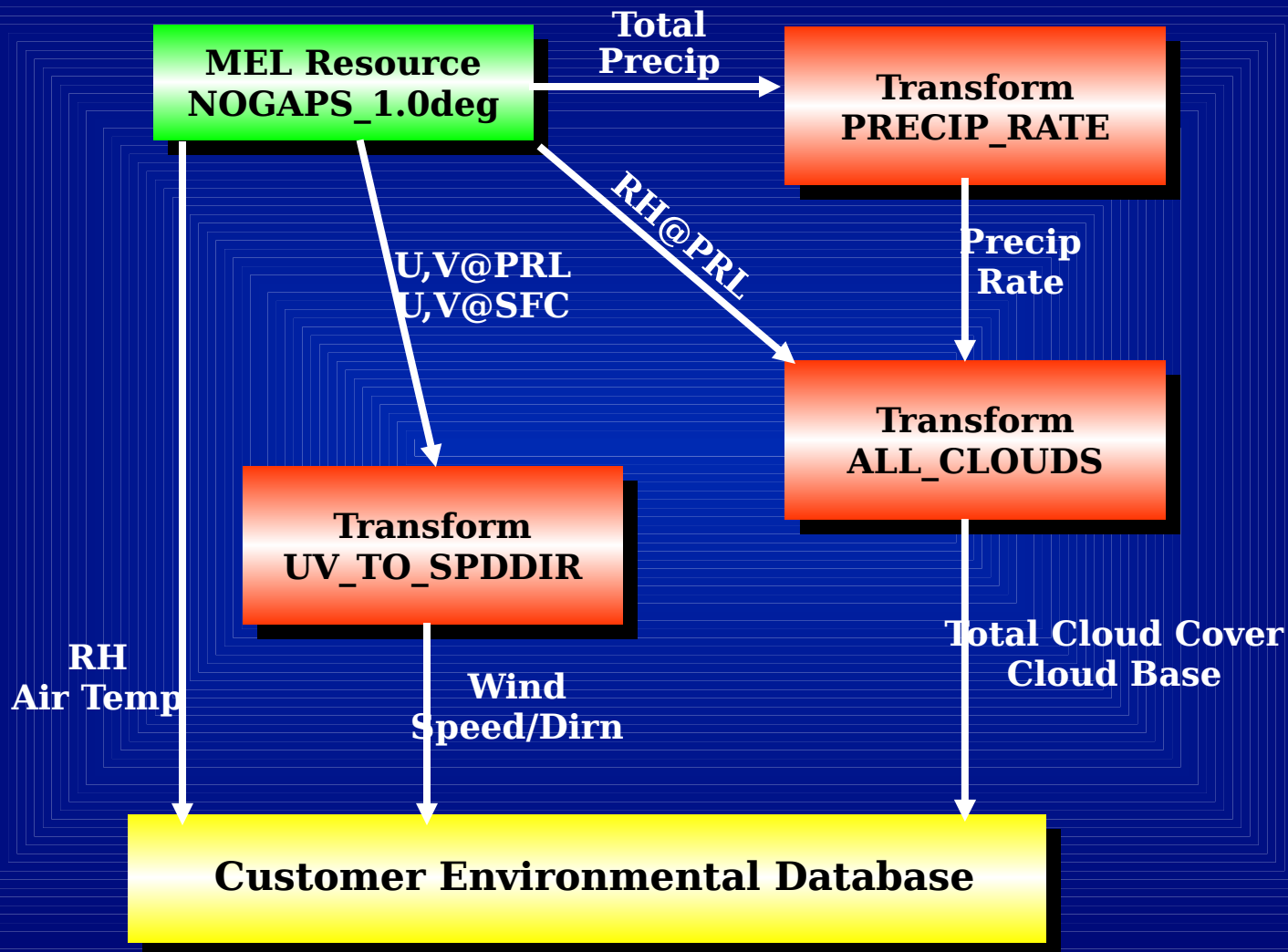 - JITOrder: Tracks the execution of a remote process
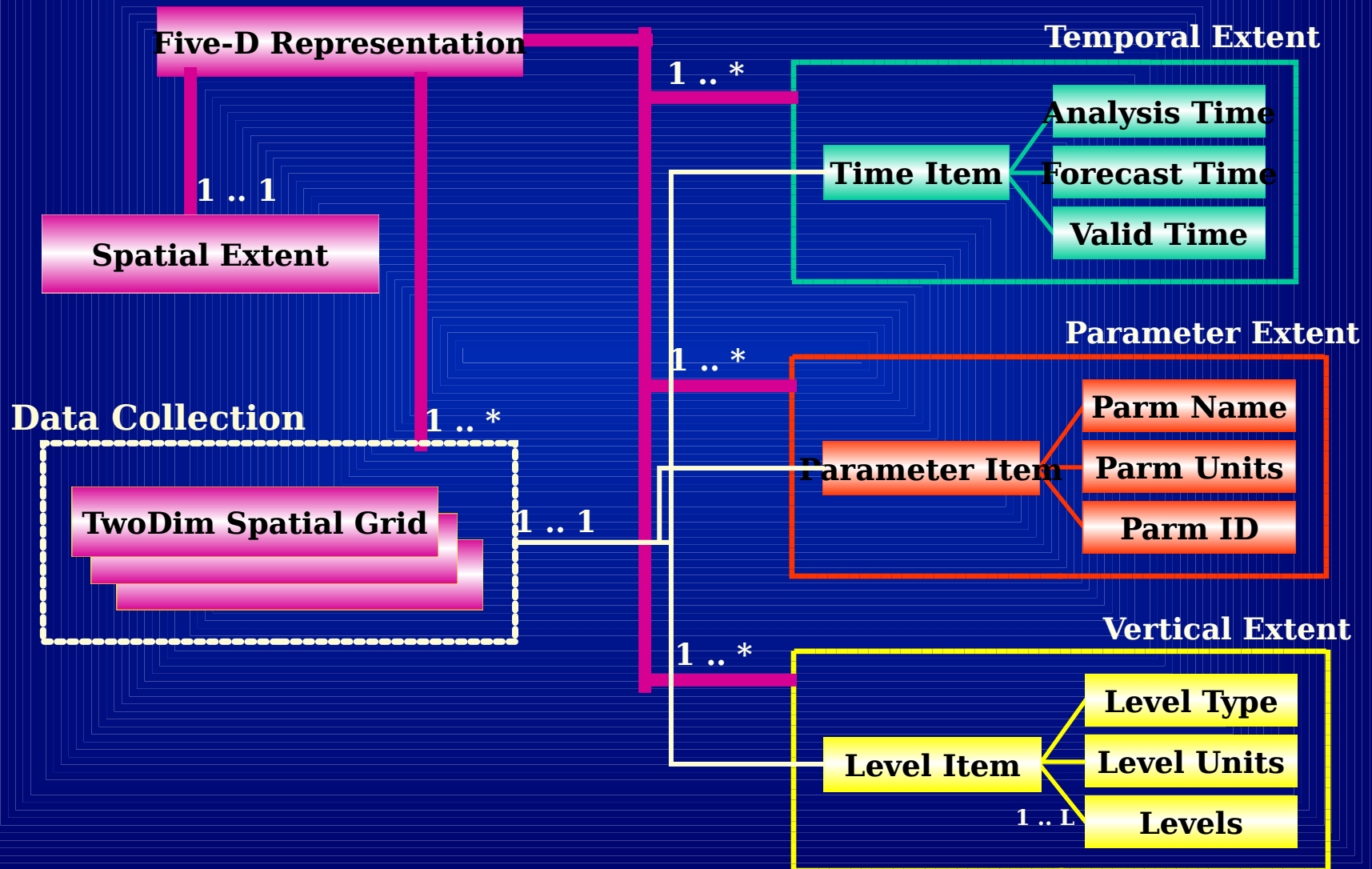
Scenario Generation Template

SGT Data / Model Dependencies

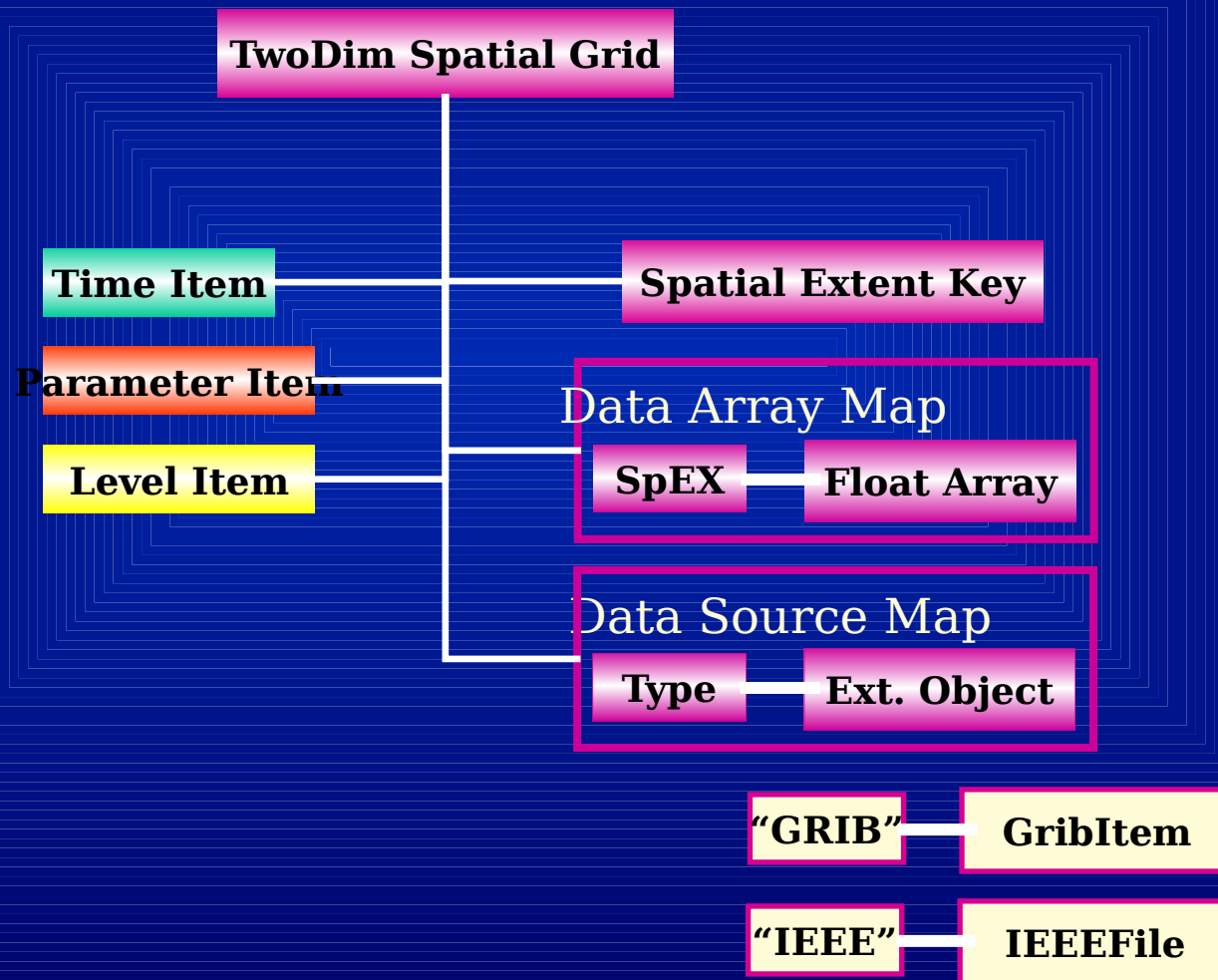# FiveDimRep Data Model

The SpatialGrid Object

TwoDim Spatial Grid

Time Item

Parameter Item

Level Item

Spatial Extent Key

Data Array Map
SpEX — Float Array

Data Source Map
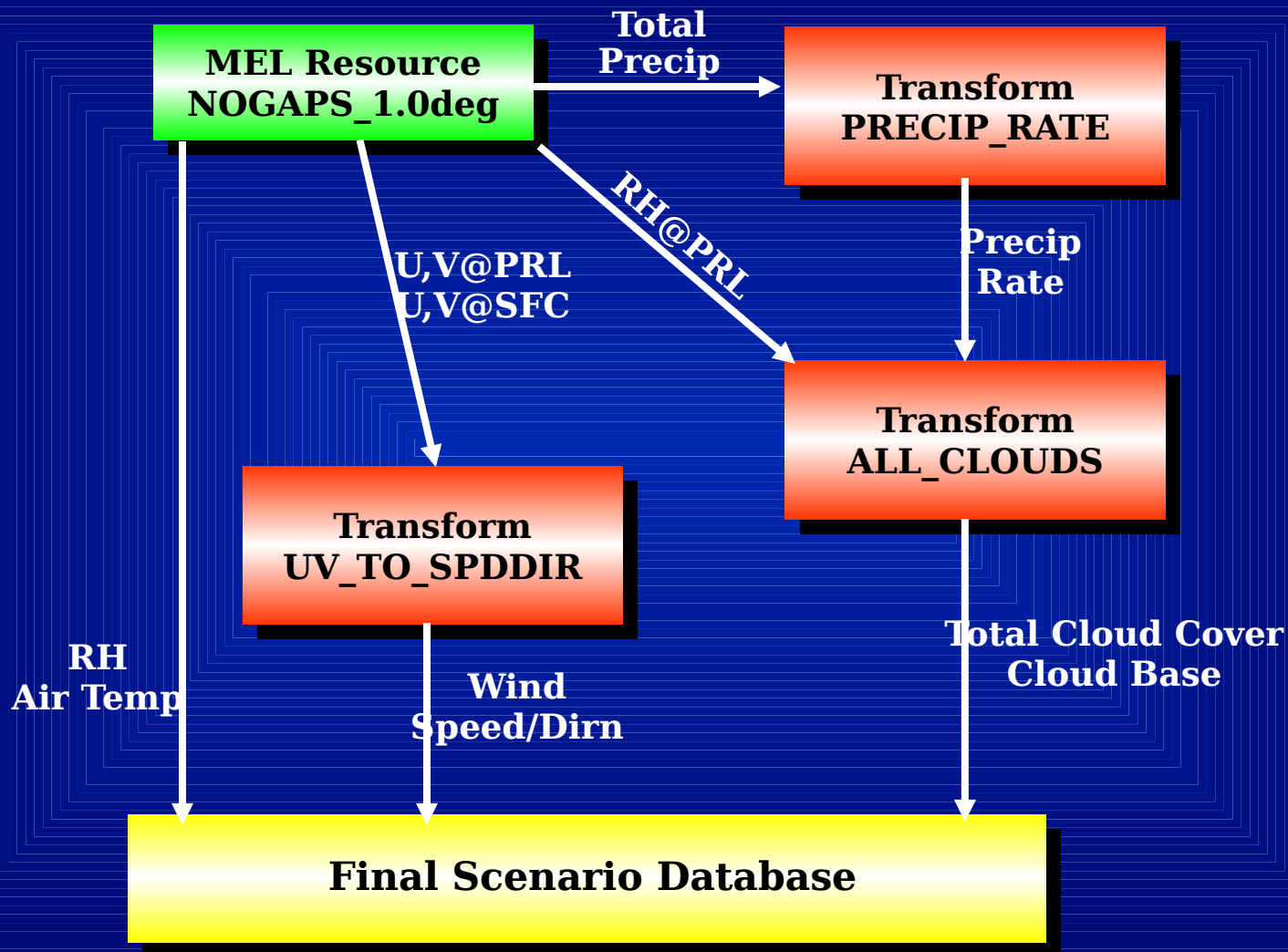Type — Ext. Object

"GRIB" — GribItem

"IEEE" — IEEEFile

FiveDimRep Utilities

- Spatial Transformations
  - Re-gridding to a new projections
  - multiple interpolation schemes, configured by parameter
  - Efficient caching mechanism to avoid re-interpolation

- Temporal Transformations
  - Forecast overlap deconfliction
  - Mapping to alternate reference time

- GRIB Parameter / Level ID Mapping
- Visualization via VISAD
- Mapping from Spatial Grids to Time Series

SGT Data / Model Dependencies

MEL Resource NOGAPS_1.0deg

Total Precip

Transform PRECIP_RATE

RH@PRL

U,V@PRL U,V@SFC

Precip Rate

Transform ALL_CLOUDS

Transform UV_TO_SPDDIR

RH Air Temp

Wind Speed/Dirn

Total Cloud Cover Cloud Base

Final Scenario Database

Conceptual Architecture
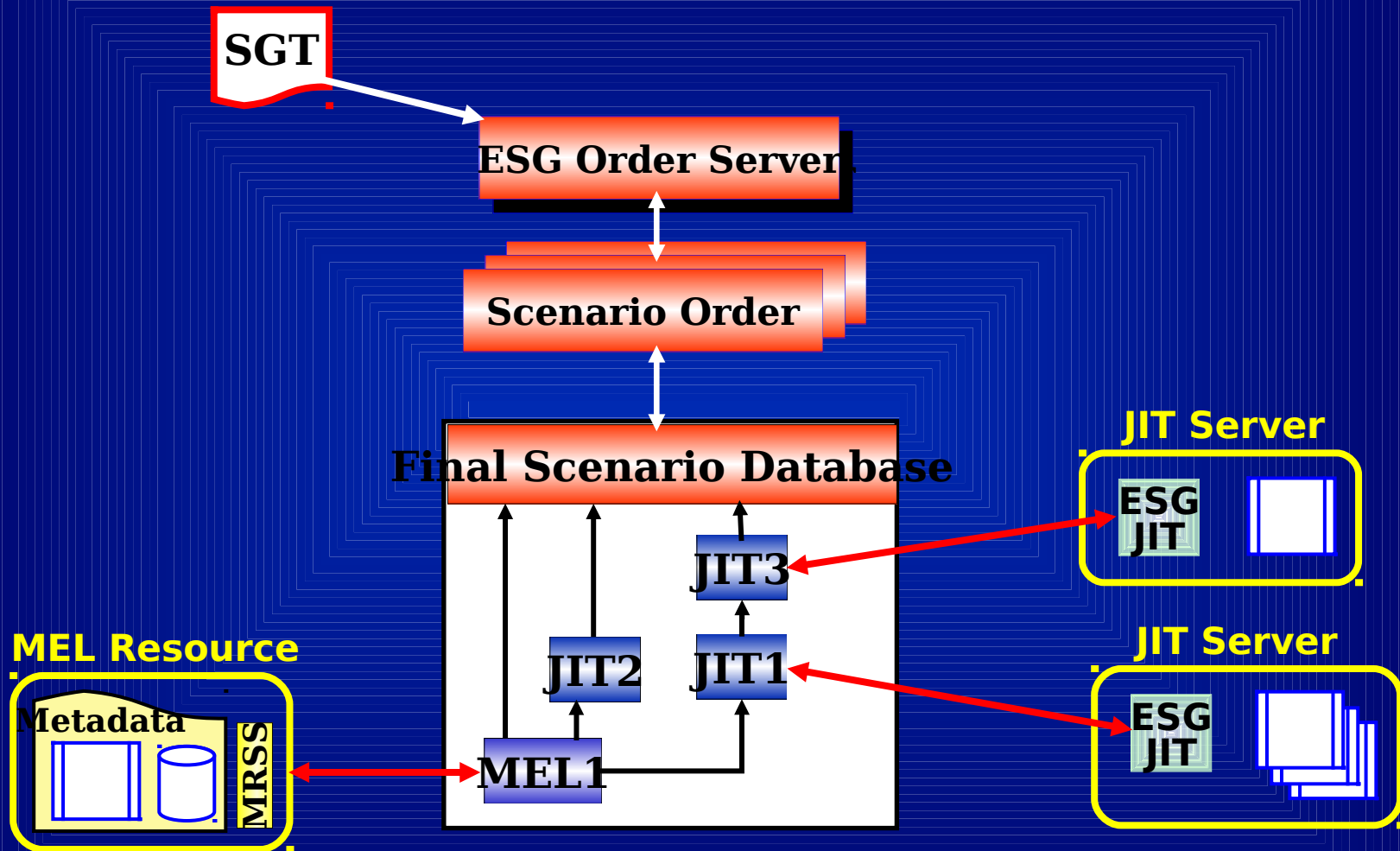
ESG Business Object Relationships

ESG Order Server

↕ **Manages**

Scenario Order

↓ **Builds**

Final Regime Map
| Name | FiveDimRep |

MEL Regime Map
| Name | FiveDimRep |

↑ **Retrieves**

MEL Order

Registers with →

Registers with →

JiT Order

Creates ↙   ↘ **Requires**

Output Regime Map
| Name | FiveDimRep |

Input Regime Map
| Name | FiveDimRep |

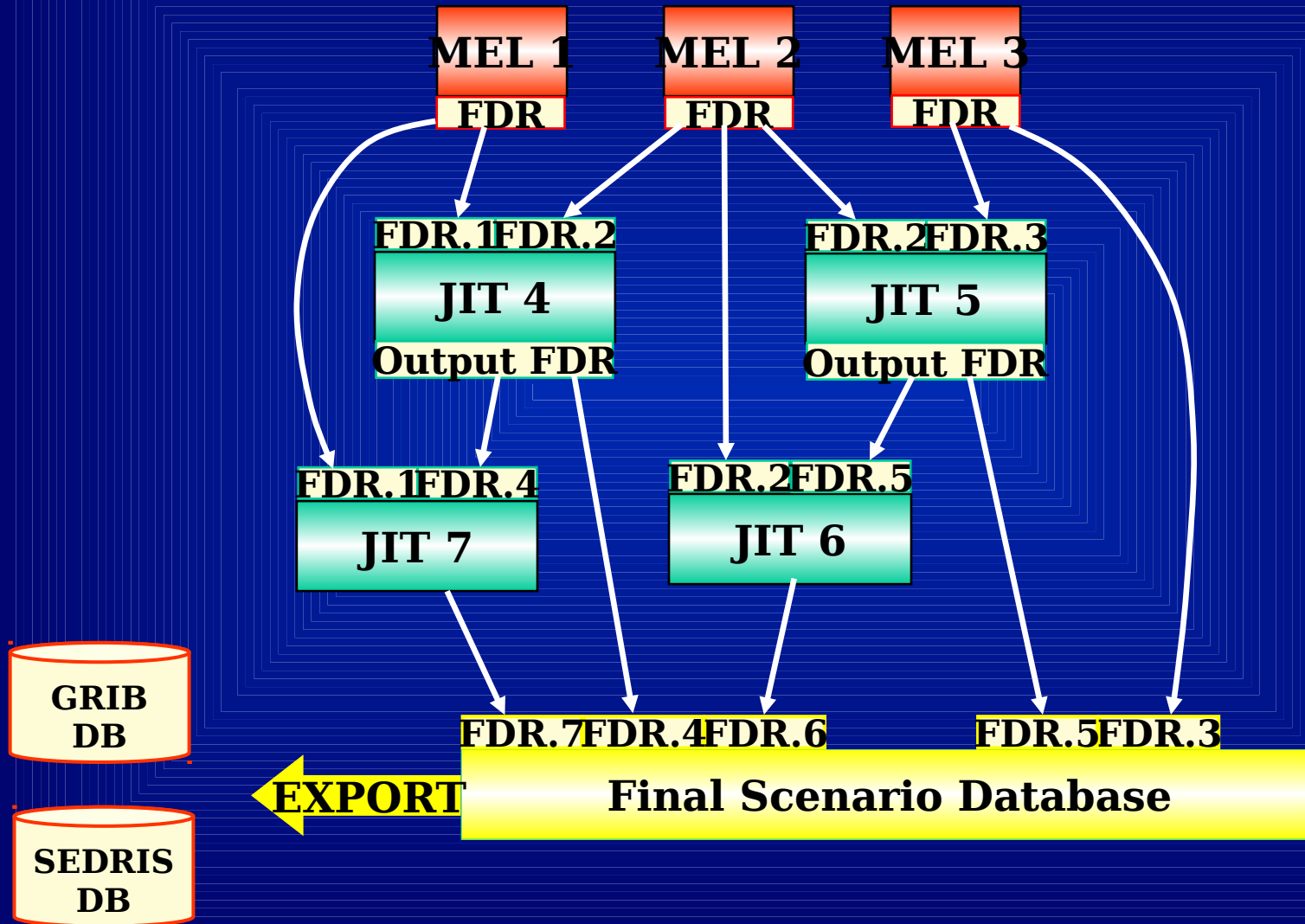*Registers with* ↗
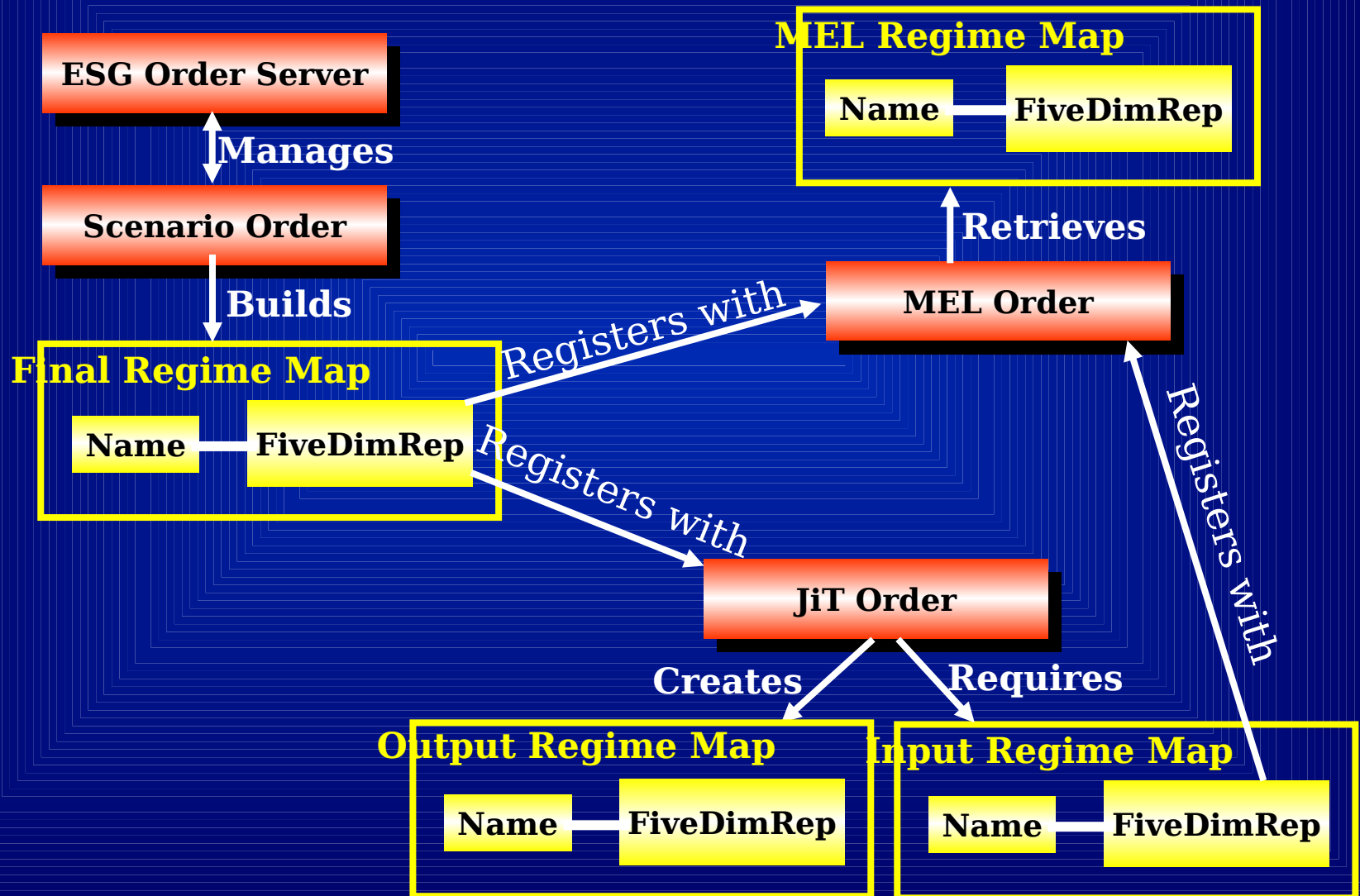
Process Control

ESG Prototype JiT Model - COAMPS

Coupled Ocean/Atmosphere Mesoscale Prediction System

- NRL Developed
- In operational use at FNMOC

NCEP/NCAR Archive

2.5 deg, 6 hr 16 mb levels

N/N-40

COAMPS Init DB's

1 km terrain 1 deg climo

Flat-File DB

COAMPS Model

81-3 km, 20 min Sigma-Z Levels

COAMPS

Data Transforms

Sigma-Z to Height LCC to Lat/Lon

Cloud Layers Visibility EM Ducting

Scenario 5-D Object

Summary

- The architecture presented is fully built and in use today supporting M&S customers
- The architecture will be extended and generalized under the INE-ARP Project

- Questions / Comments ?
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